The inventors have determined that the Bluetooth system is potentially susceptible to another type of interference, specifically one that originates from the operation of an associated cellular telephone, in particular those cellular telephones that operate in the 824MHz to 891MHz frequency band. More specifically, when the cellular telephone and the Bluetooth module operate simultaneously on the same platform, harmonic and possibly spurious signals generated by the cellular telephone transmitter can interfere with the reception of the Bluetooth system. In particular, the 3rd harmonic of the transmit signal of an Advanced Mobile Phone Service (AMPS, EIA-553) or a Code Division Multiple Access (CDMA, e.g., one based on IS-95 and later versions) or a Time Division Multiple Access (TDMA, e.g., one based on IS-54 and later versions) at least partially overlaps the ISM band where the Bluetooth devices operate. Since these harmonics are typically at a much higher level than the Bluetooth devices' receive sensitivity, the link quality of the Bluetooth system can be impaired. This is obviously an undesirable situation.

SUMMARY OF THE PREFERRED EMBODIMENTS

The foregoing and other problems are overcome, and other advantages are realized, in accordance with the presently preferred embodiments of these teachings.

A communication system is disclosed that includes a mobile station having a transmitter operating on one of a plurality of frequency channels in a first RF frequency band; an associated local area subsystem operating by frequency hopping amongst a plurality of channels in a second RF frequency band and a controller for altering a frequency hopping pattern of the local area subsystem as a function of a currently specified frequency channel in the first frequency band. In this embodiment the frequency hopping pattern is preferably also altered as a function of a bandwidth of the currently specified frequency channel of the mobile station. The frequency hopping pattern is altered if the currently specified frequency channel is one having a known frequency that lies in the second frequency band, more specifically if a frequency to be hopped-to is one that corresponds to a harmonic frequency of the currently specified frequency channel and has the potential to be interfered with by the harmonic frequency of the mobile station transmitter.

In one embodiment the frequency hopping pattern is altered by excluding at least one of the plurality of channels if the bandwidth is about 30kHz, and excluding more than one of the plurality of channels if the bandwidth is about 5MHz. The frequency hopping pattern may also be altered by selecting another channel if an excluded at least one of the plurality of channels is selected to be hopped to.

In a further embodiment a communication system is disclosed that includes the mobile station having the transmitter operating on one of the plurality of frequency channels in the first RF frequency band and the associated local area subsystem operating by frequency hopping amongst a plurality of channels in the second RF frequency band. In this embodiment the controller does not alter the frequency hopping pattern of the local area subsystem, but instead inhibits transmission of data in the local area subsystem when a hopped-to frequency is determined to be a frequency that may be interfered with because of operation of the mobile station transmitter on the currently specified frequency channel in the first frequency band. In this embodiment the transmission is preferably selectively inhibited as a function of a bandwidth of the currently specified frequency channel of the mobile station. The transmission in the local area subsystem is inhibited if the currently specified frequency channel is one having a harmonic frequency that lies in the second frequency band, more specifically if the hopped-to frequency is one that corresponds to the harmonic frequency and has the potential to be interfered with by the harmonic frequency of the mobile station transmitter.

In this latter embodiment the transmission of data in the local area subsystem may be inhibited by turning off a modulator during the slot time of the hopped-to frequency channel, thereby not transmitting data, or the transmission may be inhibited by turning off the RF carrier during the slot time of the hopped-to frequency channel, thereby also not transmitting data. The transmission of data may also be inhibited by simply transmitting random bits, or some predetermined pattern of bits, instead of the actual data to be transmitted. At the end of the slot time of the hopped-to frequency channel, and when hopping to a next channel (assuming that the next channel is not also potentially interfered with), the transmission of data is resumed, such as by once more turning on the modulator or the RF carrier, and data transmission to the local area subsystem receiver of the mobile station is resumed.

Preferably, the first frequency band is in the range of about 800MHz to about 900MHz and the second frequency band is in the range of about 2400MHz to about 2500MHz. The bandwidth may be in the range of about 30kHz to about 5MHz. More preferably, the first frequency band is in the range of about 824MHz to about 891MHz and the frequency hops occur at 2402+k MHz, where k= 0,1,...,78.

An advantage of the use of these teachings is that required re-transmissions of data in the local area communications system, due to interference from the mobile station transmitter, may be reduced or eliminated.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other aspects of these teachings are made more evident in the following Detailed Description of the Preferred Embodiments, when read in conjunction with the attached Drawing Figures, wherein:

Fig. 1 is a block diagram of a wireless communication system in accordance with these teachings;

Fig. 2 is a diagram showing a selected frequency channel, its harmonics, and the potential interference in the ISM band;

Fig. 3 is a logic flow diagram in accordance with a first method of this invention; and

Fig. 4 is a logic flow diagram in accordance with a second method of this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to Fig. 1, there is illustrated a simplified block diagram of an embodiment of a wireless communications system 5 that is suitable for practicing this invention. The wireless communications system 5 includes at least one mobile station (MS) 100. Fig. 1 also shows an exemplary network operator 10 having, for example, a GPRS Support Node (GSN) 30 for connecting to a telecommunications network, such as a Public Packet